CLAIMS

What is being claimed is:

1. A structure comprising:

a semiconductor light emitting device capable of emitting first light having a first peak wavelength; and

a wavelength converting layer overlying the semiconductor light emitting device, the wavelength converting layer being capable of emitting second light having a second peak wavelength;

wherein a color of combined light emitted by the semiconductor light emitting device and the wavelength converting layer is essentially the same as a color of the first light.

2. The structure of claim 1 wherein a spectral purity of the combined light is greater than or equal to about 50%.

3. The structure of claim 1 wherein a spectral purity of the combined light is greater than or equal to about 90%.

4. The structure of claim 1 wherein:

the combined light has an emission spectrum comprising a first peak corresponding to the first peak wavelength and a second peak corresponding to the second peak wavelength; and

a height of the second peak is less than about 10% of a height of the first peak.

5. The structure of claim 1 wherein:

the combined light has an emission spectrum comprising a first peak corresponding to the first peak wavelength and a second peak corresponding to the second peak wavelength; and

a height of the second peak is less than about 1% of a height of the first peak.

6. The structure of claim 1 wherein the first peak wavelength is between about 400 nm and about 480 nm.

7. The structure of claim 1 wherein the first peak wavelength is between about 420 nm and about 460 nm.

8. The structure of claim 1 wherein the second peak wavelength is between about 500 nm and about 620 nm.

9. The structure of claim 1 wherein a spectral luminous efficacy of the second light is more than twice a spectral luminous efficacy of the first light.

10. The structure of claim 1 wherein the semiconductor light emitting device comprises:

an active region sandwiched between an n-type region and a p-type region, the active region comprising $Al_xIn_yGa_zN$, where $0 \leq x \leq 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$, $x+y+z=1$.

11. The structure of claim 1 wherein the wavelength converting layer is capable of emitting the second light as a result of absorbing the first light.

12. The structure of claim 1 wherein:

the semiconductor light emitting device comprises:

an active region sandwiched between an n-type region and a p-type region; and

a wavelength converting layer capable emitting first light as a result of absorbing light emitted by the active region; and

the wavelength converting layer capable of emitting second light is capable of emitting the second light as a result of absorbing the first light.

13. The structure of claim 1 wherein:

the semiconductor light emitting device comprises:

an active region sandwiched between an n-type region and a p-type region; and

a wavelength converting layer capable emitting first light as a result of absorbing light emitted by the active region; and

the wavelength converting layer capable of emitting second light is capable of emitting the second light as a result of absorbing light emitted by the active region.

14. The structure of claim 1 wherein the wavelength converting layer comprises a phosphor.

15. The structure of claim 14 wherein the phosphor is selected from the group consisting of YAG:Ce, YAG:Pr+Ce, SrGaS:Eu, (Ca,Sr)S:Eu, CaS:Ce+Mn, (Sr,Li)SiO:Eu, (Ba,Sr)SiO:Eu, and SrSiN:Eu.

16. The structure of claim 14 wherein the phosphor has a thickness between about 1 microns and about 10 microns.

17. The structure of claim 14 wherein the wavelength converting layer further comprises silicate.

18. The structure of claim 17 wherein the wavelength converting layer has a thickness between about 5 microns and about 50 microns.

19. The structure of claim 1 wherein the wavelength converting layer comprises a dye.

20. The structure of claim 19 wherein the dye is selected from the group of Coumarin 6, Fluorol 7GA, Rhodamine 110, and Lumogen.

21. The structure of claim 1 further comprising:

first and second leads electrically connected to the semiconductor light emitting device; and

a lens overlying the wavelength converting layer.

22. A method of creating a light emitting device, the method comprising:

forming a plurality of semiconductor layers including an n-type region, a p-type region, and an active region disposed between the n-type region and the p-type region, the active region being capable of emitting first light having a first wavelength; and

placing a wavelength converting material overlying the active region, the wavelength converting layer being capable of emitting second light having a second wavelength;

wherein the dominant wavelength of combined light emitted by the active region and the wavelength converting layer is essentially the same as the first wavelength.

23. The method of claim 22 wherein placing a wavelength converting material overlying the active region comprises depositing a phosphor layer on one of the plurality of semiconductor layers and a growth substrate attached to the plurality of semiconductor layers.

24. The method of claim 22 wherein placing a wavelength converting material overlying the active region comprises:

placing a lens overlying the plurality of semiconductor layers; and

filling a space between the lens and the plurality of semiconductor layers with an encapsulating material mixed with the wavelength converting material.